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POLSTER, LIEDER,
WOODRUFF & LUCCHESI

JUN 20 2005

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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

BOESCHENSTEIN, Edward A.
Polster, Lieder, Woodruff &
Lucchesi
12412 Powerscourt Drive, Suite 200
St. Louis, MO 63131
ETATS-UNIS D'AMERIQUE

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	09.06.2005
Applicant's or agent's file reference TIMK 8718WO	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2004/021265	30.06.2004	02.07.2003

Applicant
THE TIMKEN COMPANY ET AL

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:

European Patent Office - P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl
Fax: +31 70 340 - 3016

Authorized Officer

Jülich, G

Tel. +31 70 340-3935

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TIMK 8718WO	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/US2004/021265	International filing date *(day/month/year)* 30.06.2004	Priority date *(day/month/year)* 02.07.2003
International Patent Classification (IPC) or national classification and IPC F16H57/02		
Applicant THE TIMKEN COMPANY ET AL		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 5 sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
01.02.2005	09.06.2005
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Goeman, F Telephone No. +31 70 340-4086

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US2004/021265

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-12	as originally filed

Claims, Numbers

1-13	filed with telefax on 28.04.2005

Drawings, Sheets

1/4-4/4	as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US2004/021265

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Closest prior art: The document JP-A-10-096463 is regarded as being the closest prior art to the subject-matter of claims 1 and 10, and discloses in figure 1: a transmission for a wind turbine comprising a helical gear (8) on the shaft and meshing with another helical gear (7) such that torque applied to the gears imparts a thrust load to the shaft depending on the direction of rotation and a first bearing (19) supporting the shaft in the housing and being capable of transferring radial loads between the shaft and the housing and a second bearing (22) supporting the shaft in the housing and being capable of transferring both radial loads and thrust loads in both axial directions between the shaft and the housing.

Problem: The two single row tapered roller bearings must be carefully adjusted at assembly.

Solution: By replacing the two single row tapered roller bearings with a single row tapered bearing with a small rib and a large rib.

Inventive step: This solution is not known from nor is it rendered obvious by any available prior art document. Although such a bearing as such is known from the Timken products catalog, this bearing is only known for small diameters and therefore not suitable for bearing thrust load in wind turbine transmissions. The independent claims 1 and 10 and dependent claims 2-9 and 11-13 therefore meet the requirements of Articles 33(2) and 33(3) PCT.

Claims:

1. In a wind turbine having a wind-driven rotor and an electrical generator, a transmission located between the rotor and the generator for transferring power between them, said transmission comprising:

a housing;

a shaft in the housing;

a helical gear on the shaft and meshing with another helical gear such that torque applied to the gears imparts a thrust load to the shaft, with the direction of the thrust depending on the direction of rotation, one direction of rotation normally resulting in a greater thrust than the other direction of rotation;

a first bearing supporting the shaft in the housing and being capable of transferring radial loads between the shaft and the housing;

a second bearing supporting the shaft in the housing and being capable of transferring both radial loads and thrust loads in both axial directions between the shaft and the housing, the second bearing including:

a cone located around the shaft and having a tapered raceway presented outwardly away from the shaft;

a cup located in the housing and having a tapered raceway presented inwardly toward the raceway on the cone;

a small rib at the small end of the tapered raceway on the cone;

a large rib at the large end of the tapered raceway on the cup; and

tapered rollers located in a single row between the raceways and between the ribs and having their tapered side faces against the raceways and their large and small end faces along the large and small ribs, respectively;

whereby thrust loads in one direction are applied to the rollers

at the raceways and in the other direction are applied to the rollers at the ribs, the bearing being oriented such that the normally greater thrust loads are applied to the rollers at the raceways.

2. A transmission according to claim 1 wherein the first bearing includes:

an inner race on the shaft and having an outwardly presented cylindrical raceway;

an outer race in the housing and having an inwardly presented cylindrical raceway presented toward the raceway of the inner race;

cylindrical rollers located between the raceways of the inner and outer races and being capable of sliding axially on at least one of the raceways.

3. A transmission according to claim 2 wherein one of the races of the first bearing has ribs between which the rollers are located.

4. A transmission according to claim 1 wherein the small rib is formed integral with the cone of the second bearing and the large rib as formed separately from the cup of the second bearing.

5. A transmission according to claim 1 and further comprising:

a second shaft on which another helical gear is carried, with that helical gear meshing with the helical gear that is carried by the shaft that is supported on the first and second bearings.

a third bearing supporting the second shaft in the housing and being capable of transferring radial loads between the shaft and the housing;

a fourth bearing supporting the second shaft in the housing and being capable of transferring both radial loads and thrust loads in both axial directions between the shaft and the housing, the fourth bearing including:

a cone located around the second shaft and having a tapered raceway presented outwardly away from the second shaft;

a cup located in the housing and having a tapered raceway presented inwardly toward the raceway on the cone;

a small rib at the small end of the tapered raceway on the cone;

a large rib at the large end of the tapered raceway on the cup; and

tapered rollers located in a single row between the raceways and between the ribs, and having side faces against the raceways and large and small end faces along the large and small ribs, respectively.

6. A transmission according to claim 5 wherein the third bearing includes:

an inner race on the second shaft and having an outwardly presented cylindrical raceway;

an outer race in the housing and having an inwardly presented cylindrical raceway presented toward the raceway of the inner race;

cylindrical rollers located between the raceways of the inner and outer races and being capable of sliding axially on at least one of the raceways.

7. A transmission according to claim 6 wherein one of the races of the third bearing has ribs between which the cylindrical rollers are located.

8. A transmission according to claim 5 wherein the small rib of the fourth bearing is formed integral with the cone of the fourth bearing and the large rib of the fourth bearing is formed separately from the cup of the fourth bearing.

9. A transmission according to claim 1 wherein the housing has a bearing seat in which the cup of the second bearing is received, and the cup at one of its ends has a flange which is too large to be received in the seat for the cup, whereby the cup will fit into the seat in only one orientation.

10. A transmission for a wind turbine having a rotor and a generator, said transmission comprising:

a housing;

a planetary set in the housing and being connected to the rotor;

a drive shaft also connected to the planetary set such that it rotates at an angular velocity greater than the velocity of the rotor;

a helical bull gear on the drive shaft;

an intermediate shaft in the housing;

locating and nonlocating antifriction bearings supporting the intermediate shaft in the housing;

a helical gear and a helical pinion carried by the intermediate shaft, with the pinion meshing with the bull gear;

an output shaft in the housing and being connected to the generator;

locating and nonlocating antifriction bearings supporting the output shaft in the housing; and

a pinion carried by the output shaft and meshing with the helical gear on the intermediate shaft;

wherein the nonlocating bearings transfer only radial loads between their shafts and the housing;

wherein the locating bearings transfer radial loads and thrust loads in both axial directions between their shafts and the housing, with each shaft normally experiencing thrust in one direction of a magnitude greater than in the other direction, each locating bearing comprising:

a cone on the shaft supported by the bearing and having a tapered raceway that is presented away from the shaft;

a cup in the housing and having a tapered raceway that is presented toward the raceway on the cone,

a small rib at the small end of the raceway on the cone;

a large rib at the large end of the raceway on the cup;

tapered rollers arranged in a single row between the raceways on the cone and cup and between the ribs, with the tapered side faces of the rollers being against the raceways and the small and large end faces of the rollers being along the small and large ribs, respectively, whereby each locating bearing can transfer thrust in both axial directions; and

wherein the locating bearings are oriented such that the greatest thrust loads are transferred through the rollers at the raceways of the bearings.

11. A transmission according to claim 10 wherein each nonlocating bearing comprises:

an inner race located around the shaft supported by the bearing and having a cylindrical raceway that is presented outwardly away from the shaft;

an outer race located in the housing and having a cylindrical raceway presented inwardly toward the raceway on the inner race, cylindrical rollers located between the raceways of the races; and

ribs on one of the races for maintaining the rollers along the raceways.

12. A transmission according to claim 11 wherein the ribs of each nonlocating bearing are on the outer race of the bearing.

13. A transmission according to claim 10 wherein the housing has bearing seats in which the cups of the locating bearings are received, and each cup at one end has a flange which is too large to be received in the seat for the cup, whereby the cup will fit into the seat in only one orientation.